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Enhancing Discovery, Search, and Access of NASA Hydrological Data by Leveraging GEOSS

NASA/Goddard Earth Sciences Data and Information Services Center (GES DISC)

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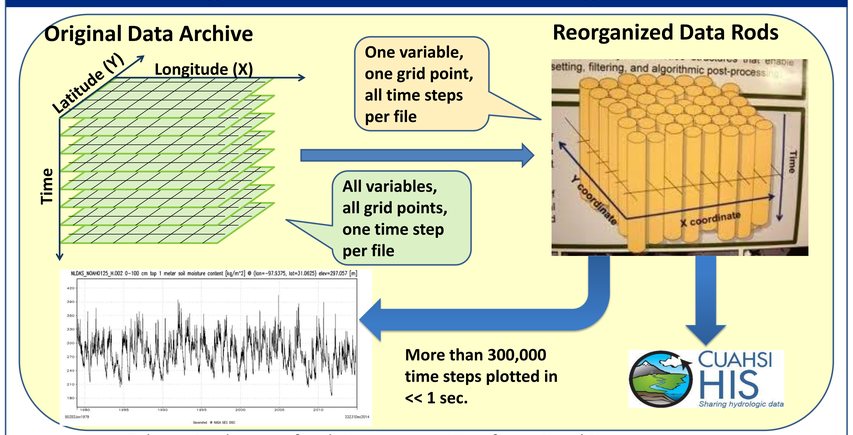
Exposing NASA data rods to the world

Motivation and Prior Work

- An ongoing NASA-funded "Data Rods" (time series) project has demonstrated the removal of a longstanding barrier to accessing NASA data (i.e., accessing archived time-step array data as point-time series) for selected variables of the North American and Global Land Data Assimilation Systems (NLDAS and GLDAS, respectively) and other NASA data sets.
- Data rods are pre-generated or generated on-the-fly (OTF), leveraging the NASA Simple Subset Wizard (SSW), a gateway to NASA data centers.
- Data rods Web services are accessible through the CUAHSI Hydrologic Information System (HIS) and the Goddard Earth Sciences Data and Information Services Center (GES DISC) but are not easily discoverable by users of other non-NASA data systems.
- An ongoing "GEOSS Water Services" project aims to develop a distributed, global registry of water data, map, and modeling services cataloged using the standards and procedures of the Open Geospatial Consortium and the World Meteorological Organization.
- Preliminary work has shown GEOSS can be leveraged to help provide access to data rods. Another ongoing NASA-funded project is extending this prior work.

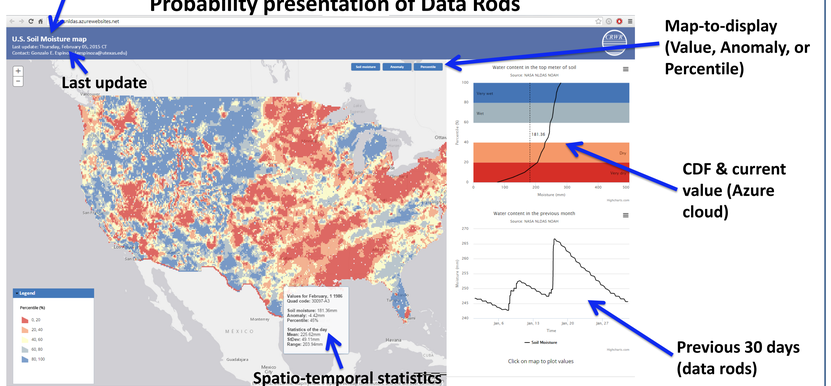
Removing Barrier to Accessing NASA Data



Schematic diagram for data reorganization for optimal time series access

Other variables available: Precipitation, Runoff, ET, Surface Temperature

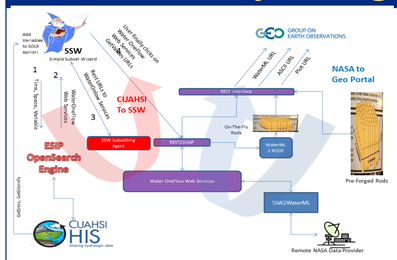
Probability presentation of Data Rods



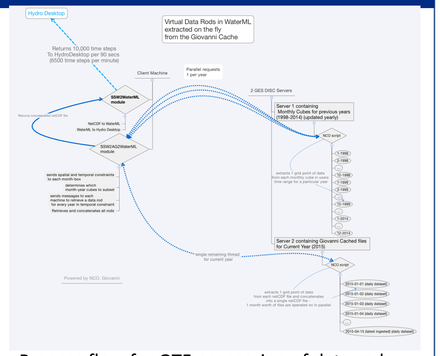
Data rods accessible via a Web interface, providing a probability description at each grid cell and for each day. Current values can be seen in the context of a probability distribution of past values, for that location and time.

Both modes of presentation of data rods to be migrated to Tethys, http://bit.ly/1AgUCbO, a web applications development and hosting environment)

NASA Hydrological Data via GEOSS

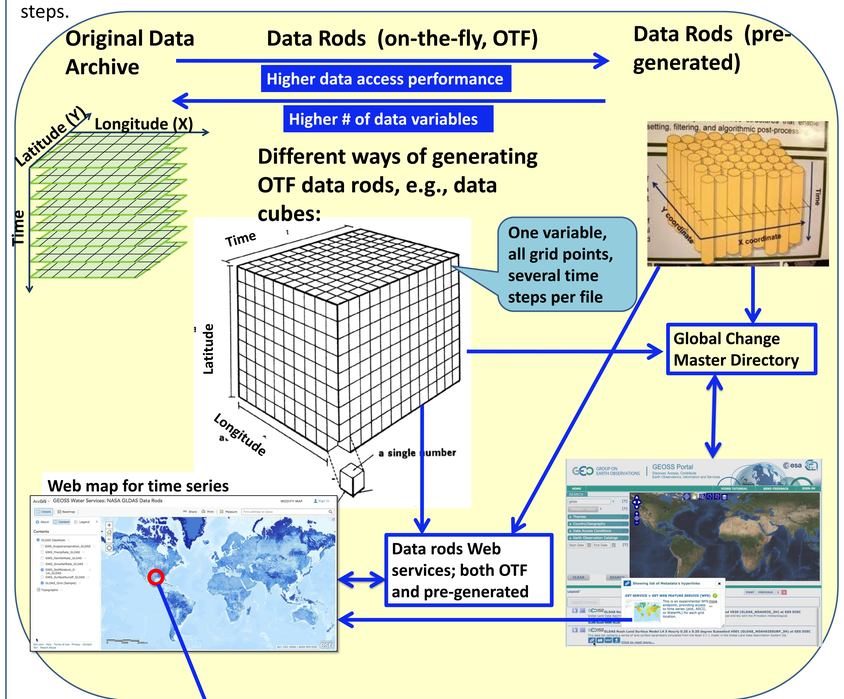


Bidirectional process flow of data and services between NASA and non-NASA data systems



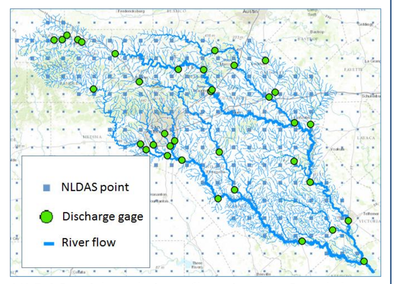
Process flow for OTF processing of data rods

OTF processing of data rods avails users many more variables than are currently available as pre-generated data rods, from both the GES DISC and, via SSW, the other participating (in SSW) data centers. The tradeoff is a shorter allowable requested time period. Current benchmark for OTF- processing performance, partially leveraging Giovanni cache: 90 seconds for 10,000 time steps.



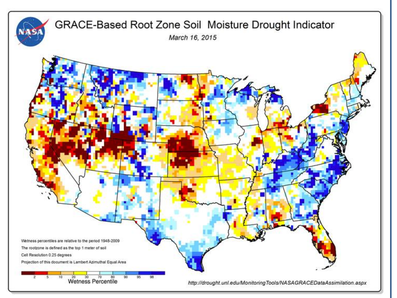
Use Cases Development

		NASA hydrological variables as data rods (currently available, pre-generated and OTF)
NLDAS-2 Hourly 0.125°	Primary Forcing	Precipitation hourly total
		2-m above ground temperature
		10-m above ground zonal wind speed
		10-m above ground meridional wind speed
		Potential evaporation
		2-m above ground specific humidity
		Longwave radiation flux downwards (surface)
		Shortwave radiation flux downwards (surface)
	Noah	0-100 cm top 1 meter soil moisture content
		0-10 cm soil moisture content
		10-40 cm soil moisture content
		40-100 cm soil moisture content
		100-200 cm soil moisture content
		0-200 cm soil moisture content
		0-10 cm soil temperature
		Surface runoff (non-infiltrating)
		Subsurface runoff (baseflow)
		Total evapotranspiration
		Latent heat flux
		Sensible heat flux
		Ground heat flux
GLDAS-1 3-hourly 0.25°	Noah Model	Precipitation rate
		Rainfall rate
		Snowfall rate
		0-100 cm top 1 meter soil moisture content
		0-10 cm layer 1 soil moisture content
		10-40 cm layer 2 soil moisture content
		40-100 cm layer 3 soil moisture content
		Total evapotranspiration
		Near surface air temperature
		Surface runoff
		Subsurface runoff
		Average layer 1 soil temperature
		Near surface wind magnitude
MERRA Hourly 0.5ox0.66667° (OTF)	Land Diagnostics	Surface total precipitation
		Top soil layer soil moisture content
		Root zone soil moisture content
		Total profile soil moisture content
		Top soil layer soil wetness
		Root zone soil wetness
		Total profile soil wetness
		Overland runoff
		Bare soil evaporation
		Evaporation from land
		Transpiration
		Mean land surface temperature (incl. snow)
		Soil temperature in (layer 1, 2, 3, 4, 5, and 6)
Tropical Rainfall Measuring Mission (TRMM) Precipitation (OTF)		
Land Parameter Retrieval Model (LPRM) Soil Moisture (OTF)		



NLDAS grid and river flow in the Guadalupe and San Antonio Basins, Texas

- Linking vertical water balance of NLDAS with horizontal transport of water through basins.
- Flows in each reach computed using RAPID model with input NLDAS runoff data rods.



Root zone soil moisture drought indicator map (March 16, 2015), based on assimilation of Gravity Recovery and Climate Experiment (GRACE) data into a land surface model.

- See http://bit.ly/1a4cigK) for weekly maps and complete description.
- Such drought indicator maps will benefit from the availability of data rods, which will aid in the interpretation of wetness conditions.

For More Information

Hydrology Portal GES DISC	LDAS Portal GSFC Hydrological Sciences Lab	Giovanni Portal NLDAS Hourly 0.125°	Giovanni Portal GLDAS 3-hourly 0.25°	Giovanni Portal Soil Moisture Daily 0.25°

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